

Analysis of ice plains of Filchner/Ronne Ice Shelf using ICESat data

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ABSTRACT

We use repeat-track laser altimeter data from the Ice, Cloud, and land Elevation Satellite (ICESat) to map the grounding zone of Filchner/Ronne Ice Shelf (FRIS), Antarctica. Repeated passes of ICESat reveal ice flexure in the grounding zone occurs as the ice shelf responds to ocean height changes due primarily to tides. In the course of our mapping, we have confirmed or identified three major “ice plains”, regions of low surface slope near the GZ where the ice is close to hydrostatic equilibrium: one on Institute Ice Stream, another to its east, and another west of Foundation Ice Stream. The vertical information from repeated ICESat tracks enables us to study the topography and flexure characteristics across these three ice plains, and we use this to develop a classification scheme for ice plains based on their surface topography and their state of flotation. We show that one of these ice plains indicates changes in lateral extent on short time-scales, depending on the state of the ocean tide. Understanding the location and nature of ice plains is important for ice sheet modeling, since they add uncertainty to the absolute boundary between floating and grounded ice.